WHAT IS CLAIMED IS:

1.   1.   A database area network (DAN) system comprising:

2.   a plurality of database management systems adapted for providing access to database

3.   data;

4.   a shared storage system, connected to said database management systems for storing said

5.   database data;

6.   a database switching system adapted for directing the transfer of data packets between at

7.   least one database client and said database management systems.

1.   2.   The system of claim 1, wherein said database switching system includes a switching

2.   device adapted for switching or routing said data packets between said at least one database

3.   client and said database management systems.

1.   3.   The system of claim 1, wherein said database switching system is adapted for translating

2.   a network destination address of a database service request received from a database client to a

3.   network destination address of a database management system.

1.   4.   The system of claim 3, wherein said translated network destination address of a database

2.   service is a network layer addresses or data link layer addresses.

1.   5.   The system of claim 3, wherein said network destination address of a database service is

2.   translated from a virtual network address to an actual network destination address.

1 6.   The system of claim 1, wherein said database switching system includes a routing or

2 switching device adapted to provide data packet routing or switching functions and said routing

3 or switching functions can be controlled using a command line interface procedure or a network

4 management protocol.

1 7.   The system of claim 1, wherein said database switching system includes a redirection

2 module adapted for relocating a database instance from a first database server to a second

3 database server.

1 8.   The system of claim 1, wherein said database switching system includes a resource

2 management module adapted for managing an association between database instances and

3 database servers.

1 9.   The system of claim 8, wherein said resource management module further includes a data

2 storage device and is adapted for storing server resource information or database instance

3 requirements in said data storage device.

1 10.   The system of claim 9, wherein said resource management module is further adapted for

2 managing the association between database instances and database servers as a function of the

3 server resource information or the database instance requirements.

1   11.   The system of claim 9, wherein said resource management module is adapted for storing

2   constraints or preferences regarding database instance redirection in said data storage device.

1   12   The system of claim 11, wherein said resource management module is further adapted

2   for managing the association between database instances and database servers as a function of

3   said constraints or preferences regarding database instance redirection stored in said data storage

4   device.

1   13.   The system of claim 1, wherein said database switching system further includes a module

2   adapted for relocating a database instance from a first database server to a second database server

3   as a function of defined database performance criteria.

1   14.   The system of claim 1, wherein said database switching system includes a database

2   switching module adapted for associating database services with network addresses.

1   15.   The system of claim 14, wherein said network addresses are virtual network addresses.

1   16.   The system of claim 14, wherein said network addresses are network layer addresses or

2   data link layer addresses.

1   17.   The system of claim 14 wherein said database switching system is adapted for directing

2   the transfer of data packets between said database clients and said database management systems

3   as a function of the associations between said database services and said network addresses.

1   18.   The system of claim 14, wherein said database switching system is adapted for directing

2   the transfer of data packets between said database clients and said database management systems

3   by replacing a network address of said data packet containing a service request with the network

4   address associated with that service.

1   19.   The system of claim 18, wherein the network address of said data packet containing a

2   service request is a virtual network address and said virtual network address is replaced with a

3   real network address associated with said service.

1   20.   The system of claim 18, wherein the network address of said data packet containing a

2   service request is for a network address on a first subnetwork and said network address is

3   replaced with a network address associated with said database service on a second subnetwork.

1   21.   The system of claim 14, wherein said database switching system includes a content

2   switch adapted to read at least a portion of the contents of packets transferred between said at

3   least on database client and said database management systems.

1   22.   The system of claim 14, wherein said database switching system includes

2   a network device adapted for routing or switching data packets across said database area

3 network, said network device including network management means for managing routing or

4 switching functions of the network device and

5   said database switching module is adapted to use said network management means to

6 control the routing or switching functions of the network device.

1   23.   The system of claim 22, wherein said network device is adapted to provide real time

2 routing of data packets across said database area network with low latency.

1   24.   The system of claim 22, wherein said network device is adapted to provide real time

2 routing of data packets across said database area network with high bandwidth.

1   25.   The system of claim 22, wherein said database switching module is adapted for

2 dynamically establishing said associations between database services and network addresses, and

3 for automatically communicating the establishment or modification to said associations to said

4 network device, whereby said database area network continues to function if said database

5 switching module stops operating.

1   26.   The system of claim 25, wherein said database switching module stops operating because

2 of a failure of said database switching module or a connection between said database switching

3 module and said network device.

1   27.   The system of claim 25, wherein said database switching module stops operating because

2   it is taken out of service for modification or upgrade.

1   28.   The system of claim 14, wherein said database switching device is further adapted for

2   dynamically associating database services with network addresses as a function of predefined

3   resource management objectives.

1   29.   The system of claim 28, wherein said resource management objectives are selected from

2   the group consisting of load balancing, quality of service, high availability and scalability.

1   30.   The system of claim 28, wherein said database services are executed on a plurality of

2   database servers corresponding to said associated network addresses and said database switching

3   module further includes:

4   monitoring means for monitoring a plurality database servers for server status and server

5   resource usage;

6   mapping means for changing the associations between database services and network

7   addresses as a function said server status and said server resource usage.

1   31.   The system of claim 30, wherein said mapping means is adapted for changing the

2   associations between database services and network addresses as a function of server resource

3   usage and said management resource objective of load balancing in order to balance the server

4   resource usage over a plurality of database servers.

1   32.   The system of claim 30, wherein said mapping means is adapted for changing the

2   associations between database services and network addresses as a function of server resource

3   usage and said management resource objective of quality of service in order to make server

4   resources available to provide a predefined level of quality of service.

1   33.   The system of claim 32, wherein said predefined level of quality of service is measured

2   as a function of allocated server resources.

1   34.   The system of claim 32, wherein said predefined level of quality of service is measured

2   as function of a quantity of database server operations processed in a specified unit of time.

1   35.   The system of claim 32, wherein said predefined level of quality of service is measured

2   as a function of a unit of time used to complete a database server operations or set of database

3   server operations.

1   36.   The system of claim 30, wherein said mapping means is adapted for changing the

2   associations between database services and network addresses as a function of server resource

3   usage and said management resource objective of high availability in order to provide that a

4   database service is available from an alternative database server if said monitoring means detects

5   that a database server providing said database service experiences a failure.

1   37.   The system of claim 30, wherein said mapping means is adapted for changing the

2   associations between database services and network addresses as a function of server resource

3   usage and said management resource objective of scalability in order to distribute database

4   resource usage over additional database resources added to the database area network.

1   38.   The system of claim 1, wherein said database switching system includes a database area

2   network administration module adapted for controlling administrative access to devices and

3   services connected to the database area network.

1   39.   The system of claim 38, wherein said database area network administration module

2   provides a plurality of levels of access including a first level which provides access to all devices

3   or services included in said database area network; and a second level of access which provides

4   access to specific databases and their associated instances.

1   40.   The system of claim 38, wherein said database area network administration module is

2   adapted for controlling access by a first network device connected to said data area network to a

3   second network device connected to said data area network.

1   41.   A method for operating a database area network (DAN) comprising the steps of:

2   connecting a plurality of database servers to a communication medium, each database

3   server including at least one database management system adapted for providing a plurality of

4   database services;

5   associating at least one database service with at least one database server; and

6   directing the transfer of database service requests to an associated database server as a

7   function of the association between at least one database service and at least one database server.

1   42.   A method according to claim 41, wherein said step of directing the transfer of database

2   service requests includes routing or switching data packets containing the database service

3   requests between a database client and said database servers.

1   43.   A method according to claim 41, wherein said step of directing the transfer of database

2   service requests includes translating a network destination address of a database service request

3   received from a database client to a network destination address of a database service.

1   44.   A method according to claim 43, wherein said translated network destination address of a

2   database service is a network layer address or data link layer address.

1   45.   A method according to claim 43, wherein said network destination address of a database

2   service is translated from a virtual network address to an actual network destination address.

1   46.   A method according to claim 41, further including the step of relocating a database

2   instance from a first database server to a second database server.

1   47.   A method according to claim 41, further including the steps of:

2   storing server resource information or database instance requirements in a data storage

3   device; and

4   said step of associating at least one database service with at least one database server

5   includes associating a database service with a database server as a function of the server resource

6   information or the database instance requirements stored in said data storage device

1   48.   A method according to claim 41, further including the step of moving a database instance

2   from a first database server to a second database server as a function of a defined database

3   performance criteria.

1   49.   A method according to claim 41, wherein the step of directing the transfer of database

2   service requests includes directing the transfer of database service requests to a database server

3   as a function of a portion of the content of a data packet containing said database service request.

1   50.   A method according to claim 41 further comprising the step of transferring database

2   service requests in real time with low latency between the database servers and database clients.

1   51.   A method according to claim 41 further comprising the step of transferring database

2   service requests in real time with high bandwidth between the database servers and database

3   clients.

1   52.   A method according to claim 41 further comprising the step of:

2   connecting a database switch (dBSwitch) to said communications medium and wherein

3   said dBSwitch is adapted for associating at least one database service with at least one database

4   server and directing the transfer of database service requests to said database servers as a

5   function of the association between said database services and said at least one database server.

1   53.   A method according to claim 52, wherein said dBSwitch includes a network device

2   adapted to provide data packet routing or switching functions to said communications medium,

3   and said routing or switching functions can be controlled using a command line interface

4   procedure or a network management protocol; and said method further includes the step of

5   controlling the routing or switching function of the routing or switching device using a command

6   line interface procedure or a network management protocol.

1   54.   A method according to claim 53, further comprising the step of modifying the switching

2   or routing function of said switching or routing device as a function of said associations between

3   the database services and said at least one database server.

1   55.   A method according to claim 52, wherein said dBSwitch includes a database switching

2   module and method includes the steps of:

3   said database switching module dynamically establishing associations between database

4   services and database servers;

5   automatically communicating the establishment or modification to said associations to

6   said network device, and,

7   continuing to transfer said database service requests to an associated database server even

8   if said database switching module stops operating.

1   56.   A method according to claim 55, wherein said database switching module stopped

2   operating because of a failure in said database switching module.

1   57.   A method according to claim 55, wherein said database switching module stopped

2   operating because it was taken out of service for modification or upgrade.

1   58.   A method according to claim 55, further comprising the step of said database switching

2   module dynamically associating database services with network addresses as a function of

3   predefined resource management objectives.

1   59.   A method according to claim 58, wherein said resource management objectives are

2   selected from the group consisting of load balancing, quality of service, high availability and

3   scalability.

1   60.   A method according to claim 58, wherein said database services are executed on a

2   plurality of database servers corresponding to said associated network addresses and said method

3   further includes the steps of

4   said database switching module monitoring a plurality of database servers for server

5   status and resource usage; and

6   said database switching module changing the associations between database services and

7   network addresses as a function of said server resource usage.

1   61.   A method according to claim 60, wherein the step of changing the associations between

2   database services and network addresses includes changing the associations between database

3   services and network addresses as a function of server resource usage and said management

4   resource objective of load balancing in order to balance the server resource usage over a plurality

5   of database servers.

1   62.   A method according to claim 60, wherein said step of changing the associations between

2   database services and network addresses includes changing the associations between database

3   services and network addresses as a function of server resource usage and said management

4   resource objective of quality of service in order to make server resources available to provide a

5   predefined level of quality of service.

1   63.   A method according to claim 62, wherein said predefined level of quality of service is

2   measured as a function of allocated server resources.

1   64.   A method according to claim 62, wherein said predefined level of quality of service is

2   measured as function of a quantity of database server operations processed in a specified unit of

3   time.

1   65.   A method according to claim 62, wherein said predefined level of quality of service is

2   measured as a function of a unit of time used to complete a database server transaction or set of

3   database server transactions.

1   66.   A method according to claim 60, wherein said step of changing the associations between

2   database services and network addresses includes changing the associations between database

3   services and network addresses as a function of server resource usage and said management

4   resource objective of high availability in order to provide that a database service is available

5   from an alternative database server if said monitoring means detects that a database server

6   providing said database service experiences a failure.

1   67.   A method according to claim 60, wherein said step of changing the associations between

2   database services and network addresses includes changing the associations between database

3   services and network addresses as a function of server resource usage and said management

4   resource objective of scalability in order to distribute database resource usage over additional

5   database resources added to the database area network.

1   68.   A method according to claim 41, wherein said database switching module includes a

2   database area network administration module and said method includes the steps of said database

3   area network administration module providing administrative access control to devices and

4   services connected to the database area network.

1   69.   A method according to claim 68, further comprising the step of:

2   said database area network administration module providing a plurality of levels of

3   access including a first level which provides access to all devices or services included in

4   connected to said database area network; and a second level of access which provides access to

5   specific databases and their associated instances.

1   70.   A method according to claim 68, further comprising the step of said database area

2   network administration module controlling access by a first network device connected to said

3   data area network to a second network device connected to said data area network.

1   71.   An apparatus adapted for transferring data packets between at least one database server

2   and at least one database user, said apparatus comprising:

3   connecting means for connecting at least one database client and at least one database

4   server; and

5   switching means for directing the transfer of said data packets between a database user

6   and at least one database server.

1   72.   An apparatus according to claim 71 wherein said switching means includes a switching

2   or routing device adapted for routing said data packets between said database client and at least

3   one of said database management systems.

1   73.   An apparatus according to claim 70 wherein

2   said directing means includes translation means for translating a network destination

3   address of a database service request received from a database client to a network destination

4   address of a database server.

1   74.   An apparatus according to claim 73 wherein said translated network destination address

2   of a database service is a network layer addresses or data link layer addresses.

1   75.   An apparatus according to claim 73 wherein said network destination address of a

2   database service is translated from a virtual network address to an actual network destination

3   address.

1   76.   An apparatus according to claim 71 further comprising a routing or switching device

2   adapted to provide data packet routing or switching functions and said routing or switching

3   functions can be controlled using a command line interface procedure or a network management

4   protocol.

1   77.   An apparatus according to claim 71 further comprising a redirection module adapted for

2   relocating a database instance from a first database server to a second database server.

1   78.   An apparatus according to claim 71 further comprising a resource management module

2   adapted for managing database instance assignments to database servers.

1   79.   An apparatus according to claim 78 wherein said resource management module further

2   includes a data storage device and is adapted for storing server resource information or database

3   instance requirements in said data storage device.

1   80.   An apparatus according to claim 79 wherein said resource management module is further

2   adapted for managing database instance assignments as a function of the server resource

3   information or the database instance requirements.

1   81.   An apparatus according to claim 79 wherein said resource management module is

2   adapted for storing constraints or preferences regarding database instance redirection in said data

3   storage device.

1   82.   An apparatus according to claim 81 wherein said resource management module is further

2   adapted for managing the association between database instances and database servers as a

3   function of said constraints or preferences regarding database instance redirection stored in said

4   data storage device.

1   83.   An apparatus according to claim 71 further comprising a module adapted for moving a

2   database instance from a first database server to a second database server as a function of a

3   defined database performance criteria.

1   84.   An apparatus according to claim 71 further comprising a database switching module

2   adapted for associating database services with network addresses.

1   85.   An apparatus according to claim 84 wherein said network address are virtual network

2   addresses.

1   86.   An apparatus according to claim 84 wherein said network address are network layer

2   addresses or data link layer addresses.

1   87.   An apparatus according to claim 84 wherein said switching means is adapted for

2   directing the transfer of data packets between said database clients and said database servers as a

3   function said associations between said database services and said network addresses.

1   88.   An apparatus according to claim 84 wherein said switching means is adapted for

2   directing the transfer of data packets between said database clients and said database

3   management systems by replacing a network address of said data packet containing a database

4   service request with the network address associated with that service.

1   89.   An apparatus according to claim 88 wherein the network address of said data packet

2   containing a service request is a virtual network address and said virtual network address is

3   replaced with a real network address associated with said service.

1   90.   An apparatus according to claim 88 wherein the network address of said data packet

2   containing a service request is for a network address on a first subnetwork and said network

3   address is replaced with a network address associated with said database service on a second

4   subnetwork.

1   91.   An apparatus according to claim 84 wherein said database switching system includes a

2   content switch adapted to read at least a portion of the contents of packets transferred between

3   said at least on database client and said database management systems.

1   92.   An apparatus according to claim 84 further comprising

2   a network device adapted for routing or switching data packets across said database area

3   network, said network device including network management means for managing routing or

4   switching functions of the network device and

5   said database switching module is adapted to use said network management means to

6   control the routing or switching functions of the network device..

1   93.   An apparatus according to claim 92 wherein said network device provides real time

2   routing of data packets across said database area network with low latency.

1   94.   An apparatus according to claim 92 wherein said network device provides real time

2   routing of data packets across said database area network with high bandwidth.

1   95.   An apparatus according to claim 92 wherein said database switching module is adapted

2   for dynamically establishing said associations between database services and network addresses,

3   and for automatically communicating the establishment or modification to said associations to

4   said network device, whereby said database area network continues to function if said database

5   switching module stops operating.

1   96.   An apparatus according to claim 95 wherein said database switching module stops

2   operating because of a failure of said database switching module or a connecting between said

3   database switching module and said network device.

1   97.   An apparatus according to claim 95 wherein said database switching module stops

2   operating because it is taken out of service for modification or upgrade.

1   98.   An apparatus according to claim 84 wherein said database switching device is further

2   adapted for dynamically associating database services with network addresses as a function of

3   predefined resource management objectives.

1   99.   An apparatus according to claim 98 wherein said resource management objectives are

2   selected from the group consisting of load balancing, quality of service, high availability and

3   scalability.

1   100.   An apparatus according to claim 98 wherein said database services are executed on a

2   plurality of database servers corresponding to said associated network addresses and said

3   database switching module further includes:

4   monitoring means for monitoring a plurality database servers for server status and server

5   resource usage;

6   mapping means for changing the associations between database services and network

7   addresses as a function said server status and server resource usage.

1   101.   An apparatus according to claim 100 wherein said mapping means is adapted for

2   changing the associations between database services and network addresses as a function of

3   server resource usage and said management resource objective of load balancing in order to

4   balance the server resource usage over a plurality of database servers.

1   102.   An apparatus according to claim 100 wherein said mapping means is adapted for

2   changing the associations between database services and network addresses as a function of

3   server resource usage and said management resource objective of quality of service in order to

4   make server resources available to provide a predefined level of quality of service.

1   103.   An apparatus according to claim 102 wherein said predefined level of quality of service is

2   measured as a function of allocated of server resources.

1   104.   An apparatus according to claim 102 wherein said predefined level of quality of service is

2   measured as function of a quantity of database server operations processed in a specified unit of

3   time.

1   105.   An apparatus according to claim 102 wherein said predefined level of quality of service is

2   measured as a function of a unit of time used to complete a database server operation or set of

3   database server operations.

1 106. An apparatus according to claim 100 wherein said mapping means is adapted for

2 changing the associations between database services and network addresses as a function of

3 server resource usage and said management resource objective of high availability in order to

4 provide that a database service is available from an alternative database server if said monitoring

5 means detects that a database server providing said database service experiences a failure.

1 107. An apparatus according to claim 100 wherein said mapping means is adapted for

2 changing the associations between database services and network addresses as a function of

3 server resource usage and said management resource objective of scalability in order to distribute

4 database resource usage over additional database resources added to the database area network.

1 108. An apparatus according to claim 71 wherein said database switching system includes a

2 database area network administration module adapted for controlling administrative access to

3 devices and services connected to the database area network.

1 109. An apparatus according to claim 108 wherein said database area network administration

2 module provides a plurality of levels of access including a first level which provides access to all

3 devices connected to said database area network; and a second level of access which provides

4 access to specific databases and associated instances of said specific databases.

1 110. An apparatus according to claim 108 wherein said database area network administration

2 module is adapted to control said database switching system to control database area network

3 access to network devices or databases.

1   111.   An apparatus according to claim 71 wherein said connecting means allows for connection

2   of the apparatus between two data link layer switches, where one data link layer switch is

3   connected to at least one database server, and the other data link layer switch is connected to at

4   least one database client

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1   112.   An apparatus according to claim 71 wherein said connecting means allows for connection

2   of the apparatus to a data link layer switch, where the data link layer switch is connected to at

3   least one database server and at least one database client